The Business Case for SWIM

5th ICNS Conference

Steven Glickman
May 4, 2005

SWIM is:

- **NAS-wide information distribution and access mechanism for current and new applications**

- **Built on top of FTI for network connectivity and security**

- **50% COTS, 30% custom software & 20% hardware providing services such as security, messaging, registry**

- **Non-proprietary, flexible, extensible, scalable solution to cost effectively meet current and future information requirements**

SWIM is Not:

- **A big system in a new facility**

- **A giant database**

- **A substitute for NAS modernization programs**

- **A set of applications**

- **An FTI replacement**

SWIM implements a modern, system-wide approach to information management necessary to support improved operations and productivity in the NAS

✓ **Meet the Mandate for Electronic Government (E-Government):**
- **Improve and expand the electronic delivery of agency services and information to external customers and employees by providing high-quality, easy to find and use, one-stop points of service**

✓ **Deliver NGATS Capability:**
- **Global Secure Access to Information**

✓ **Deliver the NAS 5 Architecture**
- **37 of 53 operational improvements call out "SWIM" as a key-related system**

✓ **Provide real value**
- **NAS 5 operational improvements identify 133 potential application-to-application interfaces. SWIM can provide those much more efficiently.**
- **SWIM delivers "*product platform*" benefits that will reduce the cost and cycle time to develop and maintain new FAA applications.**

What is a "product platform"?

A product platform seeks commonality across groups of individual products ….

- Common architecture and components for physical assembled products
- Common chemistry and manufacturing processes for gases and materials
- **Common architecture, modules, and interfaces for software products**
- **Common knowledge and information repositories for information products**
- Common knowledge and processes for financial services
- Common store layouts, product mixes, and management systems for retailers
- Common processes, protocols, techniques, and technologies for medical services

Most important, do not view platforms as monolithic entities.
The subsystems and interfaces are themselves the "platforms" that can be combined
in Lego-like fashion to solve customers' needs and problems.

Developed by Marc H. Meyer, Boston, MA. Co-Author of The Power of Product Platforms.

Examples: Camry and Lexus, Microsoft Office

- **Common interfaces and communications protocols between NAS publishers and subscribers**

- **Shared schemas for describing NAS data structures**

- **CDT infrastructure for sharing data within and between facilities providing end-to-end communications and security**

- **SWIM Core Services for discovering, registering, and securing NAS data from any SWIM-capable source**

- **SWIM Value-Added Services for analyzing, processing, redistributing and managing published NAS data**

- **Common tools for coding and debugging native SWIM applications and SWIM information migrations**

The platform approach reduces training time for new programmers, managers and users; reduces system management overhead; and allows the consolidation of applications onto fewer physical servers

NAS Shortfalls

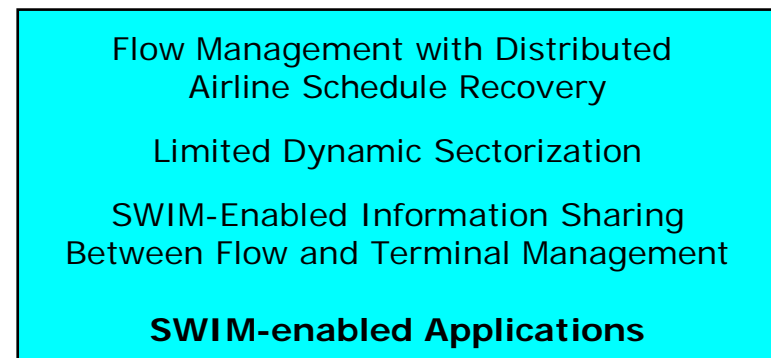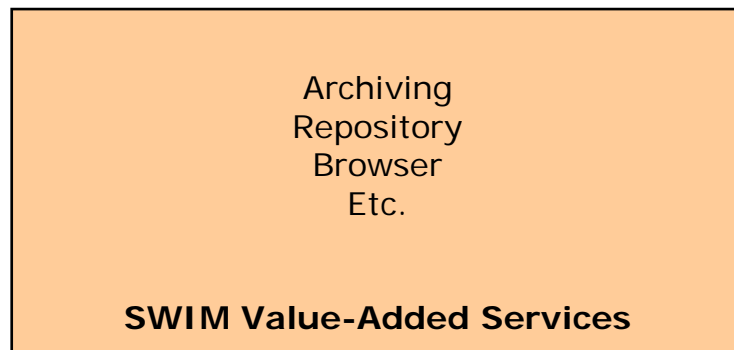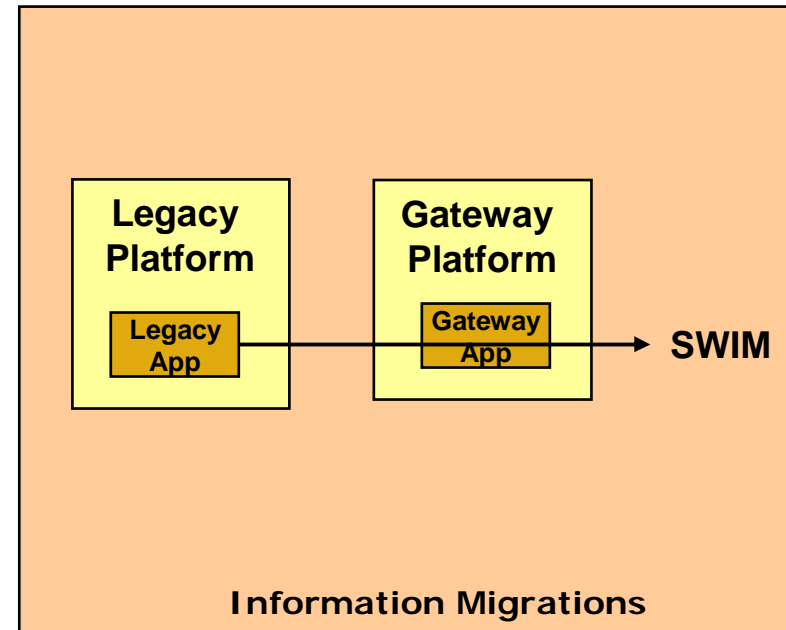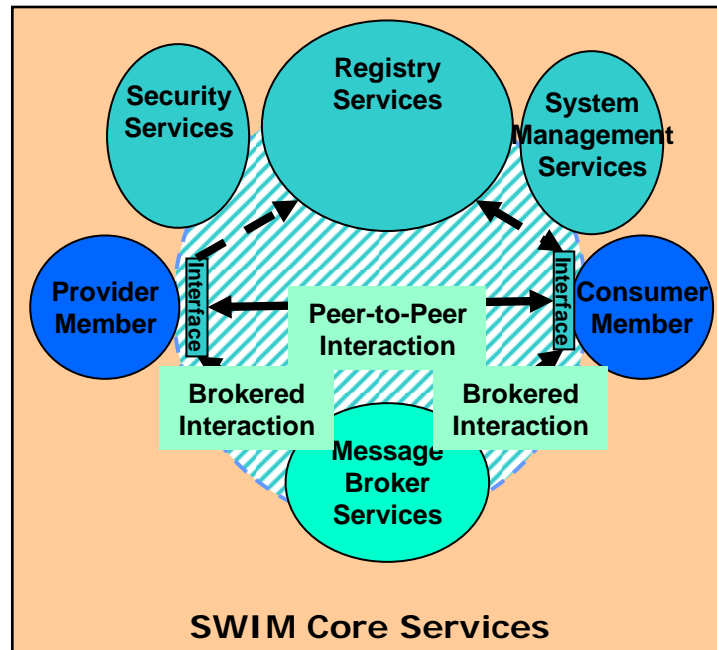| Shortfall	SWIM Mechanisms	
1) Applications cost to much	• Platform benefits for "native-SWIM" applications • Access to live data during testing and operation	Direct Benefits
2) The NAS needs to be more agile	• Quicker application development • Sever tie between geographical facilities and operations • System failure recovery • Special events planning and implementation	Indirect Benefits
3) There is a lack of common situational awareness for users	• Published data can be made available to all appropriate users, including other agencies and airspace users	
4) Current metrics don't FULLY support FAA's goal of becoming a performance-based organization	• Published data can be mined for appropriate metrics	

Only the direct benefits of SWIM are included in the CBA.

SWIM Core Services

Security Services · Registry Services · System Management Services · Provider Member · Consumer Member · Peer-to-Peer Interaction · Brokered Interaction · Brokered Interaction · Message Broker Services · Interface · Interface

Information Migrations

Legacy Platform (Legacy App) → Gateway Platform (Gateway App) → SWIM

SWIM Value-Added Services

Archiving
Repository
Browser
Etc.

SWIM-enabled Applications

Flow Management with Distributed Airline Schedule Recovery

Limited Dynamic Sectorization

SWIM-Enabled Information Sharing Between Flow and Terminal Management

Benefits Rollout

SWIM Developer's Toolkit

2007	2008	2009	2010	2011	2012	2013	2014	2015

Cost Synergies with existing programs

Application Development Savings

Application O&M Savings

Legend

SWIM Program Benefit*

SWIM Enabled Benefit*

*Thickness of arrow represents relative savings

Operational Changes
Agile NAS
Shared Situational Awareness
Performance-Based Metrics
etc.

**SWIM enables operational changes that would be unaffordable without SWIM –
e.g. 4-D trajectory-based operations**

8

Benefit 1: SWIM versus Custom Interface
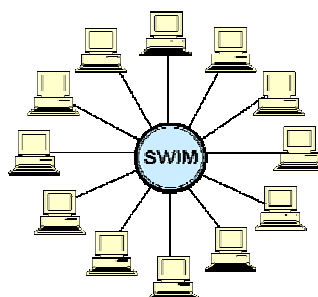
Information Migration Candidate	Key Related System	Number of Custom Interfaces
AIM	Aeronautical Information Management	21
ECG / ERAM / CARTS / STARS / ASDE	Surveillance Data Network and ERAM	70
TFM-M	Traffic Flow Modernization	11
WARP	Weather and Radar Processor	5
ERAM	En Route Automation Modernization	5
ITWS	Integrated Terminal Weather System	4
ECG	Air Route Surveillance Radar 4	3
CARTS / STARS	Airport Surveillance Radar - Model 9, 11	6
CIWS	Corridor Integrated Weather System	3
WMSCR	Weather Message Switching Center Replacement	3
STARS	Standard Terminal Automation Replacement System	2
ASDE-X	Airport Surface Detection Equipment Model X	1
12 Systems	**Totals**	**134**
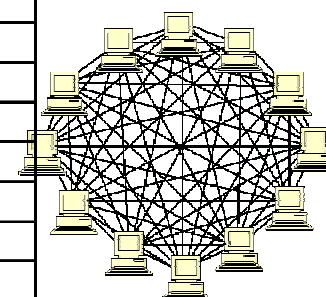
Cost per incremental SWIM interface

$3-5M based on relative complexity to custom interface, plus significant re-use, learning, etc.

Cost per custom (App-to-App) interface

$3-5M based on recent experience on URET/WARP WINS

If all NAS 5 operational improvements were implemented in the traditional approach, building custom interfaces would cost about $400M - $700M.
A SWIM approach for the 12 systems would cost an estimated $30M - $60M.

- **Platform benefits for SWIM-enabled applications**

- **Access to live data during testing and operation**

#	Improvement	#	Improvement
1	Provide Interactive Flight Planning from Anywhere	19	Enhance NAS Performance Assessment
2	Use Data Messaging to Reduce Routine Service Provider Workload And Increase Flight Efficiency	20	Expand use of RNAV/RNP Procedures
3	Shared Responsibility For Horizontal Separation	21	Provide Flexible Airspace Management
4	Incorporate Aircraft Provided Intent Data to Improve Conflict Detection, Resolution Development and Monitoring	22	Enhance Government/Agency Support
5	Extend The Use Of Radar Separation Procedures To Non-Radar Airspace Using Alternative Sources Of Surveillance	23	Increase Remote Monitoring and Maintenance
6	Use Improved Terrain Information To Share Responsibility For Aircraft To Terrain Separation	24	Provide Full Flight Plan Constraint Evaluation with Feedback
7	Manage Aircraft in Dynamic Airspace	25	Enhance Traffic Advisories Using Digital Traffic Data
8	Provide Surface Situation to Pilots and Service Providers and Vehicle Operators for All-weather Surface Operations	26	Enhance Collaborative Decision Making
9	Deploy FIS-B Nationally	27	Enhance Flight Data Management
10	Support CDM with Simultaneous Hazardous Weather Notification	28	Reduce Horizontal Separation Standards -3 Miles
11	Improve Terminal Weather Products	29	Evolve Oceanic Procedures to Domestic Enroute Separation
12	Provide Automatic Hazardous Weather Alert Notification	30	Improve Enroute Weather Products
13	Provide National Flight Information Service	31	Provide Conflict Probe with Multi-Objective Data
14	Synchronize Traffic for Flexible Entry into Oceanic Tracks	32	Optimize Runway Assignments Terminal
15	Manage Arrival and Departure Flows by Crossing and Merging Virtual Streams	33	Provide National Traffic Management of Support Fl
16	Enhance Surface Traffic Management	34	Meter Virtual Streams and Manage Arrival/Departure
17	Enhance Sector Demand Prediction and Resource Planning	35	Provide Design Criteria for Flight Objects
18	Provide Full Collaborative Decision Making	36	Provide Dynamic Re-sectorization
		37	Provide NAS Wide Sector Demand Prediction and Resolution

SWIM provides one common infrastructure for sharing data rather than the building of 37 purpose-built sub-networks.

Spiral 1 Baseline Definition

- **Implementation of initial core service**

- **Migration of CONUS Surveillance Systems:**

  - **ECG**

  - **ERAM**

  - **ASDE-X,3,3X**

  - **CARTS**
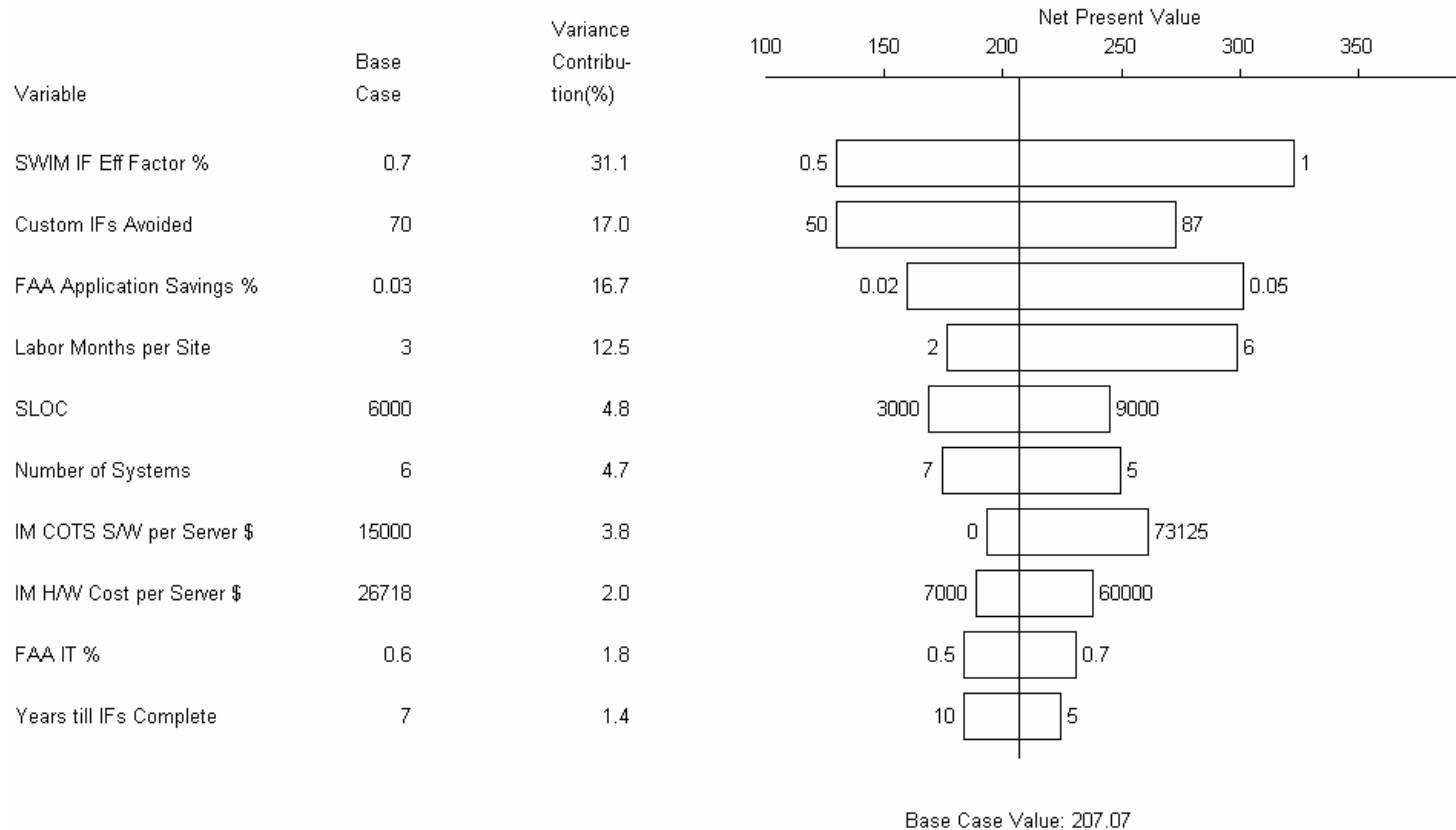
  - **STARS**

- **No Value-Added Services**

Variable	Base Case	Variance Contribu-tion(%)
SWIM IF Eff Factor %	0.7	31.1
Custom IFs Avoided	70	17.0
FAA Application Savings %	0.03	16.7
Labor Months per Site	3	12.5
SLOC	6000	4.8
Number of Systems	6	4.7
IM COTS S/W per Server $	15000	3.8
IM H/W Cost per Server $	26718	2.0
FAA IT %	0.6	1.8
Years till IFs Complete	7	1.4

Net Present Value

100	150	200	250	300	350

SWIM IF Eff Factor %: 0.5 — 1
Custom IFs Avoided: 50 — 87
FAA Application Savings %: 0.02 — 0.05
Labor Months per Site: 2 — 6
SLOC: 3000 — 9000
Number of Systems: 7 — 5
IM COTS S/W per Server $: 0 — 73125
IM H/W Cost per Server $: 7000 — 60000
FAA IT %: 0.5 — 0.7
Years till IFs Complete: 10 — 5

Base Case Value: 207.07

Summary of Preliminary Results

	Non-Recurring Costs	Net Benefits*	Total NPV (Net Benefits – Non-Recurring Costs)	Benefit-Cost Ratio
Core Services	$12.6	$34.9	$22.3	2.8
Information Migrations	$46.2	$226.5	$180.3	3.9
Total	$58.5	$265.6	$207.1	3.5

Note: All dollar figures are in NPV terms
*Net Benefits excludes non-recurring costs but includes O&M costs

Theme	Charter SWIM Program	Information Publishers Migrated	Existing Information Consumers Migrated	New Information Consumers and De-commisiong	Geographical Rollout Area	SWIM-Value Added Services
Baseline Strategy for CBA	None NAIMES CIWS SWIM-enabled application TBD	Surv: ERAM, ECG, ASDE, STARS, CARTS ASDE, CARTS, STARS, ITWS, CIWS, SAMS Surv + ITWS, CWIS, USNS, SAMS, TFM-M Systems in Transition State: ASDE; CWIS, TFM-M, NAIMEs Systems at Centers: WARP, ERAM, ECG, AIM	None Selected Systems All	None ECG through CARTS/STARS, decommision center radars	NE Corridor NE Corridor + DC Area Centers Only NAS-Wide	None Archiving Repository Browser Combination

- **SWIM can deliver real, near-term value**

- **A Spiral 1 SWIM business case may close on its own based solely on future application development savings**

- **There is no clear business case for converting legacy consumers**

- **SWIM is a change agent for implementing platform strategies for FAA application development**

- **The most powerful SWIM Spiral 1 will include a "Charter SWIM application" that is still TBD**